

**IQRPE REVIEW -
PRETREATMENT FACILITY (PTF) HLW LAG STORAGE AND FEED
BLENDING PROCESS SYSTEM (HLP) VESSELS
HLP-VSL-00022, 00027A/B, AND 00028**

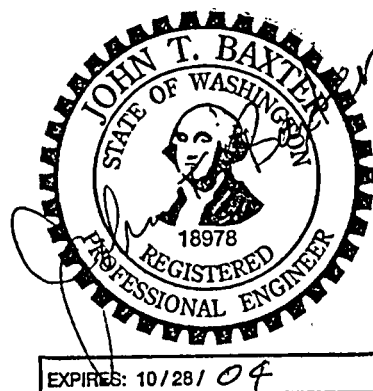
"I, John T. Baxter have reviewed, and certified a portion of the design of a new tank system or component located at the Hanford Waste Treatment Plant, owned/operated by Department of Energy, Office of River Protection, Richland, Washington. My duties were independent review of the current design for the Pretreatment Facility (PTF) HLW Lag Storage and Feed Blending Process System (HLP) Vessels HLP-VSL-00022, -00027A/B, and -00028 as required by The Dangerous Waste Regulations, namely, WAC 173-303-640(3) applicable paragraphs, i.e., (a) through (g)."

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

The documentation reviewed indicate that the design intent fully satisfies the requirements of the WAC.

The attached review is six (6) sheets numbered one (1) through six (6).

**RPP-WTP
RECEIVED
JAN 22 2004
BY PDC**



John T. Baxter
Signature

January 21, 2004
Date

**STRUCTURAL INTEGRITY ASSESSMENT
OF THE PRETREATMENT FACILITY (PTF)
HLW LAG STORAGE AND FEED BLENDING
PROCESS SYSTEM (HLP) VESSELS
HLP-VSL-00022, 00027A/B, AND 00028**

**COGEMA-IA-023
Rev. 0**

Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the U.S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

Pretreatment Facility (PTF) HLW Lag Storage and Feed Blending Process System (HLP) Vessels		COGEMA-IA-023, Rev. 0
HLP-VSL-00022, -00027A/B, and -00028		

Scope	Scope of this Integrity Assessment	<p>The scope of this integrity assessment includes the Pretreatment Facility (PTF) High Level Waste (HLW) Lag Storage and Feed Blending Process System (HLP) Vessels. These are vessels HLP-VSL-00022, HLP-VSL-00027A, HLP-VSL-00027B and HLP-VSL-00028. The primary function of the HLP System vessels is to receive and stage HLW feed from the U. S. Department of Energy, and to receive and stage HLW intermediate products (i.e. treated solids and Sr/TRU precipitates), and to blend these products prior to transfer to the HLW Vitrification Facility.</p> <p>24590-PTF-M5-V17T-P0007, Rev. 0, Process Flow Diagram HLW Feed Receipt System HLP; 24590-PTF-M5-V17T-P0008, Rev. 0, Process Flow Diagram HLW Lag Storage And Feed Blending System HLP; 24590-PTF-MV-HLP-P0003, Rev. 0, Equipment Assembly HLW Feed Receipt Vessel HLP-VSL-00022; 24590-PTF-MV-HLP-P0006, Rev. 0, Equipment Assembly HLW Lag Storage Vessel HLP-VSL-00027A; 24590-PTF-MV-HLP-P0005, Rev. 0, Equipment Assembly HLW Lag Storage Vessel HLP-VSL-P0027B; 24590-PTF-MV-HLP-P0004, Rev. 0, Equipment Assembly HLW Feed Blending Vessel HLP-VSL-00028; Mechanical Data Sheet 24590-PTF-MVD-HLP-P0006, Rev. 1, HLW Feed Receipt Vessel HLP-VSL-00022; Mechanical Data Sheet 24590-PTF-MVD-HLP-P0007, Rev. 1, HLW Lag Storage Vessel HLP-VSL-00027A; Mechanical Data Sheet 24590-PTF-MVD-HLP-P0008, Rev. 1, HLW Lag Storage Vessel HLP-VSL-00027B; Mechanical Data Sheet 24590-PTF-MVD-HLP-P0009, Rev. 1, HLW Feed Blending Vessel HLP-VSL-00028; Vessel/Tank Material Selection Data Sheet, 24590-PTF-N1D-HLP-P0003, Rev. 0, HLW Feed Receipt Vessel HLP-VSL-00022 (PTF); Vessel/Tank Material Selection Data Sheet, 24590-PTF-N1D-HLP-P0007, Rev. 1, HLW Lag Storage Vessel HLP-VSL-00027A&B (PTF); Vessel/Tank Material Selection Data Sheet, 24590-PTF-N1D-HLP-P0010, Rev. 1, HLW Feed Blending Vessel HLP-VSL-00028 (PTF); 24590-PTF-3YD-HLP-00001, Rev. 0, System Description for HLW Lag Storage and Feed Blending Process System (HLP); System Description Change Notice (SDCN) SDCN No. PTF-3YM-HLP-00001 for System Description No. 24590-PTF-3YD-HLP-00001</p>
References	<p>Drawings, Mechanical Data Sheets, Vessel/Tank Material Selection Data Sheets, and System Description</p>	

Summary of Assessment

For each item of "Information Assessed" (i.e., Criteria) on the following pages, the items listed under "Source of Information" were reviewed and found to furnish adequate design controls and requirements to assure the design intent fully satisfies the WAC requirements.

Pretreatment Facility (PTF) HLW Lag Storage and Feed Blending Process System (HLP) Vessels HLP-VSL-00022, -00027A/B, and -00028			COGEMA-IA-023, Rev. 0
Information Assessed	Source of Information	Discussion	

<p>Design</p> <p>Vessel design standards are appropriate and adequate for the vessel's intended use.</p>	<p>See Equipment Assembly drawings and Mechanical Data Sheets for Vessels HLP-VSL-00022, -00027A, -00027B and -00028 listed above; 24590-WTP-3PS-MV00-TP001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication</p>	<p>The Engineering Specification for Pressure Vessel Design and Fabrication requires that the PTF HLW Lag Storage and Feed Blending vessels (HLP-VSL-00022, -00027A, -00027B and -00028) and all vessel appurtenances are to be designed to ASME Section VIII, Division 1 rules. These design requirements are appropriate for unfired pressure vessels operating with aqueous mixed waste solutions over the pressure and temperature ranges specified for these vessels. Supplementary requirements are specified in the Engineering Specification for Pressure Vessel Design and Fabrication. These supplementary requirements address pressure vessel fatigue analysis, positive material identification, standard fabrication tolerances, acceptable welding procedures for the vessel and appurtenances, welder qualifications and testing records, NDE inspections and records, quality assurance requirements, and packaging, shipping, handling and storage requirements. These are adequate and acceptable codes and standards for these Quality Level (QL-1), Seismic Category (SC-I) vessels.</p> <p>The PTF HLW Lag Storage and Feed Blending vessels are vertical vessels with IDs ranging from 25' to 38'. Vessel vertical lengths range from approximately 24' to 29' tangent to tangent and all the vessels are supported on cylindrical skirts. Top and bottom heads are torispherical with radii equal to the tank IDs. The shells, heads and skirts are to have minimum thicknesses of 1 in. to 1 1/4 in. Materials for the shells, heads and appurtenances are to be SA-240 316 dual certified stainless steel. Dual certified 316 stainless steel meets the chemistry requirements of specification SA 240 316L and the mechanical requirements of specification SA240 316. This material is hereinafter referred to as SA240 316L stainless steel. The maximum operating volumes range from approximately 112,900 gallons for tanks HLP-VSL-00027A&B to approximately 234,500 gallons for tank HLP-VSL-00022.</p>
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Pretreatment Facility (PTF) HLW Lag Storage and Feed Blending Process System (HLP) Vessels			COGEMA-IA-023, Rev. 0
HLP-VSL-00022, -00027A/B, and -00028	Information Assessed	Source of Information	Discussion

Design	If a non-standard vessel is to be used, the design calculations demonstrate sound engineering principles of construction.	24590-WTP-3PS-MV00-TP001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication	The Engineering Specification for Pressure Vessel Design and Fabrication requires that the ASME Section VIII, Division 1 vessels (HLP-VSL-00022, -00027A, -00027B and -00028) be delivered after design, fabrication, inspection and testing with an ASME U stamp and that the vessels be registered with the National Board. They are shop fabricated vessels for mixed waste service in the Pretreatment Facility. As discussed in the item immediately above, the vessel design standards are appropriate and adequate for the vessels' intended uses.
	Vessel has adequate strength, after consideration of the corrosion allowance, to withstand the operating pressure, operating temperature, and seismic loads.	Drawings and Mechanical Data Sheets listed above under References; 24590-WTP-3PS-MV00-TP001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication; 24590-WTP-3PS-MV00-TP002, Rev. 1, Engineering Specification for Seismic Qualification Criteria for Pressure Vessels; 24590-WTP-3PI-SS90-T0001, Rev. 0, Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Vessels	The Engineering Specification for Pressure Vessel Design and Fabrication requires consideration of the operating pressures, temperatures, seismic loads, and corrosion allowance in the design process. Supplementary seismic design criteria are specified in the Engineering Specification for Seismic Qualification Criteria for Pressure Vessels to provide for the vessels seismic design analysis. The Mechanical Data Sheets identify each vessel's operating pressure and temperature ranges, the materials selected for each vessel, the corrosion allowance selected for each vessel, and the requirements for seismic design of each vessel. The Data Sheets indicate that vessels HLP-VSL-00022, -00027A, -00027B and -00028 are to be analyzed as Seismic Category 1 (SC-I) vessels which requires use of the seismic design analysis and acceptance requirements of ASME Section VIII, Division 2. Details of this analysis methodology are furnished in the Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks. The Equipment Assembly drawings specify minimum thicknesses for the vessel shells and heads ranging from 1 in. to 1 1/4 in. These are appropriate requirements and criteria to ensure the vessels have adequate strength to withstand all loads at their end of service life.

Pretreatment Facility (PTF) HLW Lag Storage and Feed Blending Process System (HLP) Vessels HLP-VSL-00022, -00027A/B, and -00028			COGEMA-IA-023, Rev. 0
Information Assessed	Source of Information	Discussion	

Foundations	Vessel foundation will maintain the load of a full vessel.	See drawings and Material Data Sheets listed above under References; 24590-WTP-3PS-MV00-TP001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication	Cylindrical skirts are specified for each of the vessels with minimum thicknesses of 1 inch of SA240 304 dual certified stainless steel as shown on the equipment assembly drawings and specified in the Material Data Sheets. Dual certified 304 stainless steel meets the chemistry requirements of specification SA 240 304L and the mechanical requirements of specification SA240 304. This thickness is adequate to support the loads of full vessels. A ring beam is included at the base of each of the skirts to spread the vessel loads on the foundation rings and provide for anchor bolting. The Engineering Specification for Pressure Vessel Design and Fabrication requirements provide for adequate vessel foundation designs.
	If in an area subject to flooding, the vessel is anchored.	24590-WTP-3PS-MV00-TP001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication	Buoyant forces of an empty vessel in a flooded room are a standard design load case in this specification for Pressure Vessel Design and Fabrication.
	Vessel system will withstand the effects of frost heave.	System Description and SDCN listed under References above; 24590-WTP-DC-ST-01-001, Rev. 1, Structural Design Criteria	The System Description identifies that vessels HLP-VSL-00022, -00027A, -00027B and -00028 are located in black cells in the Pretreatment Facility. The Structural Design Criteria requires that structural foundations extend into the surrounding soil below the frost line to preclude frost heave. The frost line is located 30" below finished grade. Therefore the HLP vessels will not be subject to frost heave.

Pretreatment Facility (PTF) HLW Lag Storage and Feed Blending Process System (HLP) Vessels			COGEMA-IA-023, Rev. 0
HLP-VSL-00022, -00027A/B, and -00028		Discussion	
Information Assessed	Source of Information		

Waste Characteristics		Information Assessed	Source of Information	Discussion
	Characteristics of the waste to be stored or treated have been identified (ignitable, reactive, toxic, specific gravity, vapor pressure, flash point, storage temperature)		Mechanical Data Sheets, Vessel/Tank Material Selection Data Sheets, and System Description and SDCN listed above under References; 24590-WTP-PSAR-ESH-01-002-02, Rev 1a, Preliminary Safety Analysis Report (PSAR) to Support Construction Authorization; PT Facility Specific Information	Normal design and operating conditions are listed for vessels HLP-VSL-00022, -00027A, -00027B and -00028 on the Mechanical Data Sheets and in the Vessel/Tank Material Selection Data Sheets. The HLP vessels provide for receipt and staging of slurry wastes from the DOE, lag storage of intermediate HLW separation products, and blending of the final feed for transfer to the HLW Vitrification Facility. The PSAR identifies that all of the system HLP vessels require active mixing and head space purge air flow for flammable hydrogen control. Hydrogen control in the HLP vessels is dependent on availability of the Pulse Jet Mixers to maintain the solids in suspension to prevent potential hydrogen accumulation in slurry layers inside the vessels. The PTF Vessel Vent Process System and a backup forced purge air ventilation system provide for hydrogen control in the HLP vessels during normal operations, abnormal operations, and during post – design basis seismic event conditions as discussed in the PSAR. Each vessel is furnished with a grounding lug to control the discharge of static electricity. The system description specifies that energized electrical sources are not allowed within the main vessel primary boundaries. All of the HLP vessels are equipped with cooling jackets for removal of radiolytically generated heat. All of the HLP vessels use SA 240 316L stainless steel for the containment boundaries which is adequate for this service as discussed in the Vessel/Tank Material Selection Data Sheets.
	Vessel is designed to store or treat the wastes with the characteristics defined above and any treatment reagents.		See Mechanical Data Sheets and Vessel/Tank Material Selection Data Sheets for Vessels HLP-VSL -00022, -00027A, -00027B and -00028 listed above	As noted in the entry above, vessels HLP-VSL-00022, -00027A, -00027B and -00028 are designed to store the waste they receive. The HLP System Description document identifies that the vessels will be used for lag storage and HLW feed blending of primarily caustic waste with small amounts of neutral waste. No additional chemical reagents will be added to the vessels contents for processing during normal operations.
	The waste types are compatible with each other.		System Description and SDCN listed above under References	The primary material handled in vessels HLP-VSL-00022, -00027A, -00027B and -00028 is aqueous HLW feed and pretreated HLW feed at pHs in the range of 13 to 14. These wastes are compatible.

Pretreatment Facility (PTF) HLW Lag Storage and Feed Blending Process System (HLP) Vessels HLP-VSL-00022, -00027A/B, and -00028			COGEMA-IA-023, Rev. 0
Information Assessed	Source of Information	Discussion	

Corrosion Protection	Vessel material and protective coatings ensure the vessel structure is adequately protected from the corrosive effects of the waste stream and external environments (expected to not leak or fail for the design life of the system)	System Description and SDCN listed above under References; Drawings and Vessel/Tank Material Selection Data Sheets listed above under References	<p>The HLP system description identifies that vessels HLP-VSL-00022, -00027A, -00027B and -00028 will be located in black cells at elevation 0 feet in the PTF. They have design service lives of 40 years because there will not be access for maintenance. The Vessel/Tank Material Selection Data Sheets for these vessels identify the chemical characteristics of the HLW feed and the pretreated HLW feed, the expected operating temperatures, and the anticipated normal operations that will occur in the vessels at pH 13 and above. Based on these parameters, SA 240 316L stainless steel was selected as an appropriate material choice with a recommended corrosion allowance of 0.04 in. for a 40 year service life. As shown on the Equipment Assembly drawings, each of the vessels is equipped with internal spray rings to provide for periodic internal cleaning of the vessels to minimize or eliminate solid waste deposits to limit corrosion.</p>
Corrosion Allowance	Corrosion allowance is adequate for the intended service life of the vessel.	Drawings and Vessel/Tank Material Selection Data Sheets listed above under References	<p>The Vessel/Tank Material Selection Data Sheets specify a uniform corrosion allowance of 0.040 inches for a 40 year vessel life which is adequate for SA 240 316L stainless steel in this waste environment. The materials chosen, welding processes selected, surface preparation, and preservice inspections are appropriate for caustic waste service. As shown on the Equipment Assembly drawings, each of the vessels is equipped with internal spray rings to provide for periodic internal cleaning of the vessels to minimize or eliminate solid waste deposits to limit corrosion.</p>
Pressure Relief	Pressure controls (vents and relief valves) are adequately designed to ensure pressure relief if normal operating pressures in the vessel are exceeded.	Drawings, and System Description and SDCN listed above under References	<p>All of the HLP vessels have unrestricted overflow lines as shown on the Process Flow Diagrams that are routed to PWD-VSL-00033 which is located at a lower elevation in the PTF. The System Description of the HLP processes indicates that all overflow lines are sized to handle the largest possible flow rates into each of the vessels. Nozzle sizes on the Equipment Assembly drawings are consistent with this requirement.</p>